

# Minerals of the heulandite series in Norway - additional data and summary

Fred Steinar Nordrum, Alf Olav Larsen & Muriel Erambert

## Introduction

An introductory investigation of heulandite series minerals from Norwegian localities was published by Nordrum et al. (2003). During the last two years, a number of additional samples from Norwegian localities have been donated to the authors (Table 1). These samples have now been analysed in order to establish the correct identity according to the nomenclature of Coombs et al. (1997).

## Analysing conditions

The chemical analyses were conducted on a CAMECA SX-100 electron microprobe at the Institute for Geology, University of Oslo, using the same analytical conditions as reported in the heulandite investigation by Nordrum et al. (2003). Back-scattered electron imaging was used to investigate the compositional zoning of the crystals.

## Occurrences and results

The first part of the investigation included analyses of heulandites from 22 localities (Nordrum op sit.). The present investigation includes heulandites from 25 new occurrences. The results are presented in Table 2, which give the chemical composition (in weight %), structural formula based on 72 O (anhydrous), and mol-% of heulandite-Ca (Heu-Ca), heulandite-Sr (Heu-Sr), heulandite-Ba (Heu-Ba), heulandite-Na (Heu-Na), and heulandite-K (Heu-K). Each analysis is denoted by two letters which assign the locality, a number which denotes the mineral fragment (crystal), and a capital letter which denotes the analytical spot within the fragment. Table 3 gives the analytical results for heulandites reported by Larsen et al. (2005).

The occurrences are found in different regions and environments and are of different ages:

### *Oslo region (Permian)*

Heulandite from cavities in granite, nordmarkite, nepheline syenite pegmatite dykes, basalt and contact metamorphosed Cambro-Silurian sediments have been investigated (19 occurrences).

In the Drammen granite strontian potassian heulandite-Ca with a very low content of sodium and barium occurs at Haukåsen, while at Vardåsen parts of the crystals are calcian heulandite-K and parts are potassian heulandite-Ca. The strontium and barium contents are significant, while the sodium content is very low.

In nordmarkite at Surka, Lunner, potassian heulandite-Ca occurs, with very low contents of strontium, barium and sodium. At Huken, Grorud, heulandite-Ca occurs, with distinct contents of strontium and potassium and low content of barium and sodium.

As revealed in the first part of the investigation, nepheline syenite pegmatites within the larvikite complex contained potassian heulandite-Ca (Buer) and sodian heulandite-Ca (Bjørndalen, Hasle and Røyås quarries).

Five occurrences in basalts from Holmestrand and Horten have been analysed. The heulandites show significant zoning. The content of barium is low, but the four other extra-

framework cations show great variation. Some grains in the samples from Falkensten, crossroad E18 and Reggestad have zones with both heulandite-K and heulandite-Ca. The sample from Sjøskogen has heulandite-K, while Valtersborg (earlier wrongly denoted Watersborg) has heulandite-Ca. In the samples from Valtersborg, crossroad E18 and Falkensten single analyses of heulandite-Ca zones give equal contents of mol-% heulandite-Ca and heulandite-Sr. A few zones in the samples from Falkensten and crossroad E18 show a high content of sodium (up to 28 mol-% heulandite-Na). In one analysis from crossroad E18 sodium is actually dominant among the extra-framework cations. This is the first heulandite-Na analysis from Norway. The strongly zoned heulandite at crossroad E18 contains heulandite-Ca, heulandite-K and heulandite-Na and also has a high content of strontium (up to 25 mol-% heulandite-Sr).

All seven occurrences within Cambro-Silurian rocks contain heulandite-Ca. They also have a significant content of strontian and potassium and very low barium and sodium, except the sample from Hørtekollen which has a significant barium content, but very low strontium, sodium and potassium contents. The results in more detail: Hørtekollen (Lier) barian heulandite-Ca, Lauvtjønn (Øvre Eiker) potassian heulandite-Ca, Bjørndalen strontian potassian heulandite-Ca, Myrsetra strontian potassian heulandite-Ca, Sørskogen (Lier) potassian heulandite-Ca, Lierskogen strontian potassian heulandite-Ca, Feiring heulandite-Ca and strontian potassian heulandite-Ca in two distinct parts of the crystal (the former has a very high Ca-content and a very low content of the other cations).

#### ***Kongsberg region (Permian veins in Precambrian rocks) (5 deposits)***

The first study confirmed that heulandite from the mines Ringnesgangen, Anne Sophie and Fiskeløs all were heulandite-Ca, although a few analyses from the Fiskeløs mine showed the highest barium-content ever recorded in heulandite at that time. Further analyses from the Nordre Ravnås prospect in southern Vinoren showed strong zoning, where a major part of the crystals had barium as the dominant extra-framework cation, the other part was heulandite-Ca. As heulandite-Ba had not been discovered earlier, it was thoroughly described, and approved as a new mineral in the heulandite group by the Commission of New Minerals and Mineral Names in 2003 (No. 2003-001). Type specimen was donated to Geological Museum, University of Oslo. Description of the mineral was published by Larsen et al. (2005). Calcian strontian heulandite-Ba and barian strontian heulandite-Ca were also discovered in the Bratteskjerpet mine. Heulandite-Ba in both deposits occurred in calcite veins containing barite, harmotome and brewsterite-Ba.

#### ***Bamble region (Precambrian)***

Heulandites from 5 localities (7 finds) have been investigated. In general, all analysed heulandites from this region had low contents of barium, strontium and sodium and high contents of calcium and potassium.

At Haslestad, Arendal, the heulandite aggregates contained grains from two different generations with very different chemistry. One generation was a very pure heulandite-Ca (94 mol-%), the other was a quite homogeneous calcian heulandite-K.

From the Langsev mine, Arendal, the zoned crystals partly consisted of calcian heulandite-K and partly of potassian heulandite-Ca, while from another unknown Arendal mine potassian heulandite-Ca was identified.

Two finds from the Ravneberget quarry, Risør, also revealed potassian heulandite-Ca. Finds from two different pockets in the Valberg quarry, Kragerø, also had crystals mainly consisting of potassian heulandite-Ca, but crystals from both finds had a very narrow zone of calcian heulandite-K.

#### ***Precambrium of southern Norway***

A sample from Flåt nickel mine contained, as earlier verified, heulandite-Ca with quite low and fairly even contents of the other four extra-framework cations.

### Western Norway (Caledonian)

Heulandites from 5 localities have been analysed. Samples from Osterøy and Naustdal both carried potassian heulandite-Ca with extremely low content of sodium and barium. The occurrence at Berdalen (Luster) contained calcium and strontium in fairly equal amounts, making the main part of the crystal strontian heulandite-Ca and a smaller part calcian heulandite-Sr, while crystals from the Årdal locality partly contained strontian heulandite-Ca and partly barian heulandite-Ca. At Tyin (Vang) the crystals were also strongly zoned containing both calcian heulandite-Ba, barian heulandite-Ca and strontian heulandite-Ca (Fig. 1).

### Gudbrandsdalen and Valdres

At Sjoa, Gudbrandsdal, strongly zoned crystals contained heulandite-Ba, calcian heulandite-Sr and strontian heulandite-Ca. An analysis gave 16.57 % BaO, which is the highest barium content ever recorded in heulandite (Larsen et al. 2005).

Crystals from Trono-odd, Lom, were potassian heulandite-Ca, while crystals from Sandvasslia, Øystre Slidre, Valdres, were strontian heulandite-Ca. The samples from both localities were quite homogeneous.

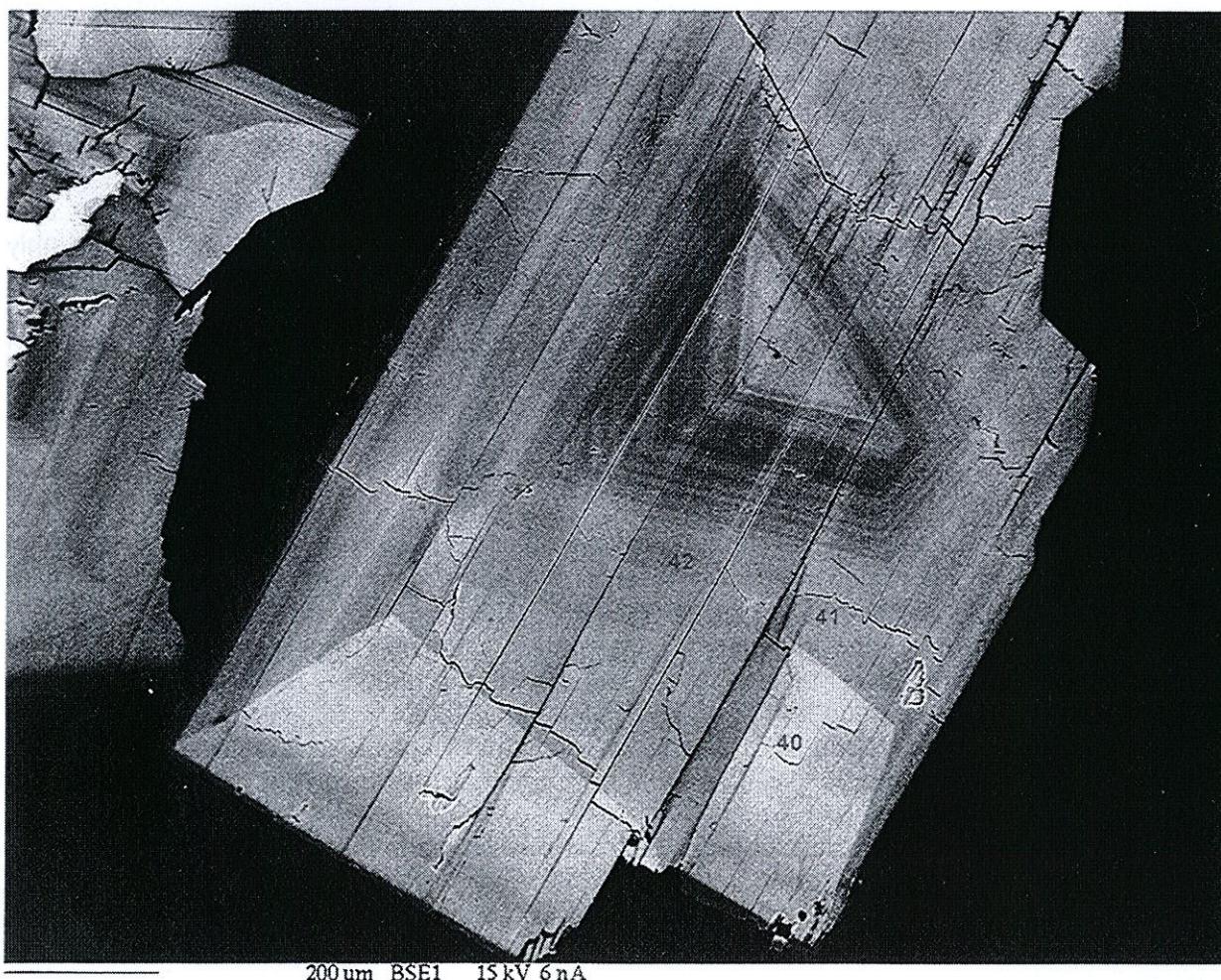


Fig. 1. Back-scattered electron image of a heulandite crystal from Tyin (Vang) showing oscillatory chemical zoning. The lightest bands have the highest barium content.

### **Oppdal-Rennebu-Kvikne**

Heulandites from 5 localities have been analysed. A sample from Innset in Rennebu was potassian barian heulandite-Ca. Samples from Åmotsdal (2 occurrences) and Blåhø in Trollheimen, Oppdal, were both quite homogeneous strontian potassian heulandite-Ca, while a sample from Dølvadseter, Kvikne, was barian potassian heulandite-Ca.

### **Nordland (Caledonian)**

Heulandites from 3 occurrences have been investigated in the first study. Two deposits in Sulitjelma verified zoned crystals partly consisting of strontian heulandite-Ca and partly of calcian heulandite-Sr. Crystals from Majavatn consisted mainly of strontian heulandite-Ca, but a narrow zone consisted of calcian heulandite-Sr.

### **Conclusions**

Although heulandite from some occurrences is quite homogeneous, the same mineral from other localities is strongly zoned, often showing large chemical variations within the same crystal. Sometimes more than one species are present within the same crystal.

As expected, heulandite-Ca is by far the most common species in the heulandite group. Heulandite-Ca has been found in all occurrences except Sjøskogen, Holmestrand.

Heulandite-K has been found in Vardåsen in the Drammen granite, Falkenstein, crossroad E18, Reggestad and Sjøskogen in the Holmestrand-Horten area, and in Haslestad, Langsev and Valberg in the Bamble region.

Heulandite-Sr has been verified from the two Sulitjelma deposits and Majavatn in Nordland, from Sjoa in Gudbrandsdalen and from Berdalens Luster, Sogn og Fjordane.

The new species heulandite-Ba was found during the investigation (Larsen et al. 2005). This mineral has been discovered in Nordre Ravnås prospect (type locality), Bratteskjerpet mine, Sjoa in Gudbrandsdalen and Tyin in Vang. The latter occurrence was revealed after the type mineral description was published.

One analysis from crossroad E18 in Holmestrand gave heulandite-Na.

There are some regional and host rock conformities in abundances and deficiencies of the elements. Most distinct is this in the Bamble region where all analyses gave high contents of calcium and potassium, and low contents of the three other extra-framework cations.

### **Acknowledgement**

Our sincere thank to all the donators of samples for this investigation.

### **References**

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Table 1. List of localities, types of occurrence and donators.

<b>Localities</b>	<b>Type of occurrence</b>	<b>Donators of material</b>
Blåhø, Trollheimen, Oppdal	Vein in Precambrian gneiss	Harald Taagvold
Dølvadseter, Kvikne	Quartz vein in quartz mica schists	Harald Taagvold
Åmotsdalen 1, Oppdal	Vein in Precambrian gneiss	Tor Witsø
Åmotsdalen 2, Oppdal	Vein in Precambrian gneiss	Tor Witsø
Sandvasslia, Øystre Slidre		Per Berget
Haslestad, Arendal	Calcite veins in amphibolite	Alf Olav Larsen
Lierskogen pukkverk, Lier	Contact metamorphic sediments	Atle Mikalsen
Bratteskjerpet, Kongsberg	Calcite veins	Harald Kristiansen
Årdal	Crystals on diopside crystal	Stig Larsen/Trond Bergstrøm
Tyin, Vang	Cataclastic zone	Torgeir T. Garmo
Berdalen, Luster	Pegmatite in garnet amphibolite	Torgeir T. Garmo
Trono-odd, Lom	Mineralized vein in gneiss	Torgeir T. Garmo
E-18 avkjøring, Holmestrand	Basalt	Torgeir T. Garmo
Nord for Sjøskogen/Tvillingbro, Holmestrand	Basalt	Stig Larsen
Øst for Reggestad gård, Holmestrand	Basalt	Stig Larsen
Rv ved Falkenstein, Horten	Basalt	Stig Larsen
Pålshaugen, Feiring	Skarn	Bjørn Skår
Vardåsen, Asker	Drammen granite	Svein Stensrud
Haukåsen, Drammen	Drammen granite	Svein Stensrud
Myrsetra, Drammen	Skarn	Svein Stensrud
Sørvollen, Lier	Skarn	Svein Stensrud
Huken, Grorud, Oslo	Nordmarkite	Lars Olav Kvamsdal
Surka, Midtmoen, Lunner	Nordmarkite	Lars Olav Kvamsdal

Table 2. The new analytical results for Norwegian heulandites.

Table 2a	Dølvadseter, Kvikne							
	DS1-A	DS1-B	DS1-C	DS1-D	DS1-E	DS1-F	DS1-G	DS1-H
SiO <sub>2</sub>	55.94	55.88	57.52	56.15	56.31	58.43	56.35	54.21
Al <sub>2</sub> O <sub>3</sub>	15.34	15.34	15.34	15.95	15.32	15.94	16.70	16.24
MgO	0.00	0.00	0.04	0.02	0.00	0.04	0.02	0.02
CaO	3.58	4.12	4.61	4.91	3.95	5.01	3.90	4.35
FeO	0.00	0.00	0.00	0.04	0.04	0.00	0.06	0.08
SrO	2.01	2.06	1.64	1.72	1.96	2.04	3.00	2.77
BaO	6.58	6.25	5.51	5.13	6.95	4.33	5.75	6.50
Na <sub>2</sub> O	0.19	0.05	0.00	0.01	0.00	0.00	0.13	0.15
K <sub>2</sub> O	1.77	1.90	2.23	1.92	2.07	2.00	2.12	1.86
Total	85.41	85.60	86.89	85.85	86.60	87.79	88.03	86.18
Si	27.234	27.221	27.302	26.818	27.183	27.208	26.700	26.485
Al	8.802	8.807	8.581	9.141	8.716	8.748	9.326	9.351
Mg	0.000	0.000	0.028	0.014	0.000	0.028	0.014	0.015
Ca	1.867	2.150	2.344	2.558	2.043	2.500	1.980	2.277
Fe	0.000	0.000	0.000	0.016	0.016	0.000	0.024	0.033
Sr	0.567	0.582	0.451	0.485	0.549	0.551	0.824	0.785
Ba	1.255	1.002	1.025	0.978	1.315	0.790	1.068	1.244
Na	0.179	0.047	0.000	0.009	0.000	0.000	0.119	0.142
K	1.099	1.180	1.350	1.191	1.275	1.188	1.281	1.160
Heu-Ca	38	43	45	49	39	50	38	41
Heu-Sr	11	12	9	9	11	11	16	14
Heu-Ba	25	20	20	19	25	16	20	22
Heu-Na	4	1	0	0	0	0	2	3
Heu-K	22	24	26	23	25	24	24	21

Table 2b	Åmotsdalen 1, Oppdal					
	ÅD1-A	ÅD1-B	ÅD1-C	ÅD1-D	ÅD1-E	ÅD1-F
SiO <sub>2</sub>	57.84	60.06	57.90	58.80	57.80	57.18
Al <sub>2</sub> O <sub>3</sub>	16.48	15.74	16.28	15.54	15.94	15.61
MgO	0.02	0.14	0.00	0.00	0.02	0.00
CaO	6.04	4.40	6.24	6.34	6.07	5.88
FeO	0.00	0.02	0.03	0.02	0.05	0.00
SrO	3.49	2.65	2.80	1.70	3.36	3.27
BaO	0.23	0.09	0.38	0.06	0.19	0.40
Na <sub>2</sub> O	0.02	0.00	0.07	0.02	0.00	0.00
K <sub>2</sub> O	2.06	1.54	1.84	1.67	1.87	1.86
Total	86.18	84.64	85.54	84.13	85.30	84.20
Si	26.909	27.820	27.017	27.495	27.099	27.175
Al	9.036	8.593	8.953	8.564	8.808	8.744
Mg	0.014	0.097	0.000	0.000	0.014	0.000
Ca	3.011	2.184	3.120	3.176	3.049	2.994
Fe	0.000	0.008	0.012	0.008	0.020	0.000
Sr	0.941	0.712	0.758	0.461	0.913	0.901
Ba	0.042	0.016	0.069	0.011	0.035	0.074
Na	0.018	0.000	0.063	0.018	0.000	0.000
K	1.223	0.910	1.095	0.996	1.118	1.128
Heu-Ca	58	57	61	68	60	59
Heu-Sr	18	19	15	10	18	18
Heu-Ba	1	0	1	0	1	1
Heu-Na	0	0	1	0	0	0
Heu-K	23	24	21	21	22	22

Table 2c	Sandvasslia, Øystre Slidre					
	SV1-A	SV1-B	SV1-C	SV2-A	SV2-B	SV2-C
SiO <sub>2</sub>	58.84	59.63	59.90	58.40	58.34	56.85
Al <sub>2</sub> O <sub>3</sub>	15.42	15.93	15.33	15.23	16.15	16.36
MgO	0.00	0.03	0.02	0.02	0.01	0.02
CaO	5.76	5.20	5.68	5.60	4.83	5.25
FeO	0.02	0.00	0.00	0.06	0.00	0.03
SrO	3.16	4.70	3.35	3.78	5.55	4.27
BaO	0.61	1.09	0.82	0.81	2.19	1.22
Na <sub>2</sub> O	0.06	0.00	0.13	0.09	0.17	0.33
K <sub>2</sub> O	1.10	1.30	1.06	1.17	1.38	1.28
Total	84.97	87.88	86.29	85.16	88.62	85.61
Si	27.517	27.343	27.632	27.456	27.005	26.860
Al	8.499	8.609	8.334	8.439	8.811	9.110
Mg	0.000	0.020	0.014	0.014	0.007	1.409
Ca	2.886	2.555	2.807	2.821	2.395	2.658
Fe	0.008	0.000	0.000	0.024	0.000	0.012
Sr	0.857	1.250	0.896	1.030	1.490	1.170
Ba	0.112	0.196	0.148	0.149	0.397	0.226
Na	0.054	0.000	0.116	0.082	0.153	0.302
K	0.656	0.760	0.624	0.702	0.815	0.772
Heu-Ca	63	54	61	59	46	52
Heu-Sr	19	26	20	22	28	23
Heu-Ba	2	4	3	2	3	6
Heu-Na	1	0	3	2	3	6
Heu-K	14	16	14	15	16	15

Table 2d	Haslestad, Arendal							
	HS1-A	HS1-B	HS1-C	HS1-D	HS1-E	HS2-A	HS3-A	HS4-A
SiO <sub>2</sub>	58.79	57.86	59.15	57.38	58.67	60.24	64.29	63.65
Al <sub>2</sub> O <sub>3</sub>	15.55	16.33	16.66	15.82	15.58	15.65	16.19	16.30
MgO	0.42	0.41	0.47	0.45	0.50	0.58	0.06	0.03
CaO	3.92	3.30	3.70	3.51	3.70	3.85	8.40	8.70
FeO	0.04	0.00	0.05	0.07	0.00	0.08	0.04	0.00
SrO	1.69	2.51	2.42	2.25	1.69	1.45	0.00	0.02
BaO	1.75	2.66	2.54	2.14	1.74	1.83	0.00	0.10
Na <sub>2</sub> O	0.63	0.45	0.46	0.45	0.36	0.40	0.26	0.28
K <sub>2</sub> O	3.64	3.92	4.04	3.78	4.02	3.97	0.11	0.05
Total	86.43	87.44	89.49	85.85	86.26	88.05	89.35	89.13
Si	27.392	27.022	26.975	27.143	27.400	27.507	27.777	27.635
Al	8.539	8.988	8.954	8.820	8.576	8.422	8.244	8.341
Mg	0.292	0.285	0.320	0.317	0.348	0.395	0.040	0.019
Ca	1.957	1.651	1.808	1.779	1.851	1.884	3.888	4.047
Fe	0.016	0.000	0.019	0.028	0.000	0.031	0.014	0.000
Sr	0.457	0.680	0.640	0.617	0.458	0.384	0.000	0.005
Ba	0.320	0.487	0.454	0.397	0.318	0.327	0.000	0.017
Na	0.569	0.407	0.407	0.413	0.326	0.354	0.218	0.236
K	2.164	2.335	2.350	2.281	2.395	2.313	0.060	0.028
Heu-Ca	36	30	32	32	35	36	93	94
Heu-Sr	8	12	11	11	9	7	0	0
Heu-Ba	6	9	8	7	6	6	0	0
Heu-Na	10	7	7	8	6	7	5	5
Heu-K	40	42	42	42	45	44	1	1

Table 2e	Lierskogen, Lier							
	LS1-A	LS1-B	LS1-C	LS1-D	LS1-E	LS2-A	LS2-B	LS2-C
SiO <sub>2</sub>	58.19	59.55	58.86	57.56	57.08	58.21	56.99	58.29
Al <sub>2</sub> O <sub>3</sub>	16.29	15.59	15.61	15.99	15.24	16.01	16.03	15.48
MgO	0.08	0.15	0.17	0.03	0.27	0.12	0.08	0.23
CaO	5.08	5.37	5.68	4.96	4.86	5.16	5.04	4.77
FeO	0.09	0.00	0.03	0.04	0.10	0.07	0.03	0.00
SrO	4.86	3.71	3.96	3.92	3.75	3.75	4.76	3.97
BaO	0.57	1.22	1.77	1.18	2.80	1.47	0.27	1.61
Na <sub>2</sub> O	0.41	0.19	0.03	0.28	0.00	0.00	0.15	0.16
K <sub>2</sub> O	1.49	0.93	1.02	1.44	0.83	1.15	1.57	1.13
Total	87.06	86.71	87.13	85.40	84.93	85.94	84.92	85.64
Si	26.994	27.477	27.280	27.139	27.290	27.220	27.020	27.393
Al	8.906	8.478	8.527	8.885	8.587	8.823	8.952	8.574
Mg	0.055	0.103	0.117	0.021	0.192	0.084	0.057	0.161
Ca	2.525	2.655	2.821	2.506	2.489	2.585	2.560	2.402
Fe	0.035	0.000	0.012	0.016	0.040	0.027	0.012	0.000
Sr	1.307	0.993	1.064	1.072	1.040	1.017	1.309	1.082
Ba	0.104	0.221	0.321	0.218	0.525	0.269	0.050	0.296
Na	0.369	0.170	0.027	0.256	0.000	0.000	0.138	0.146
K	0.882	0.547	0.603	0.866	0.506	0.686	0.950	0.677
Heu-Ca	49	58	58	51	55	57	51	52
Heu-Sr	25	22	22	22	23	23	26	24
Heu-Ba	2	5	7	4	12	6	1	6
Heu-Na	7	4	1	5	0	0	3	3
Heu-K	17	12	12	18	11	15	19	15

Table 2f	Bratteskjerpet, Kongsberg							
	BS1-A	BS1-B	BS1-C	BS1-D	BS2-A	BS2-B	BS2-C	BS-2D
SiO <sub>2</sub>	57.10	58.90	59.33	56.57	55.20	53.34	52.78	53.37
Al <sub>2</sub> O <sub>3</sub>	15.69	16.04	16.33	15.61	16.13	15.70	15.55	15.92
MgO	0.02	0.03	0.00	0.02	0.01	0.00	0.01	0.12
CaO	3.80	5.07	5.02	3.00	3.31	2.46	2.36	2.49
FeO	0.00	0.00	0.00	0.00	0.02	0.02	0.05	0.00
SrO	2.77	3.50	3.88	1.18	1.77	1.98	1.32	1.96
BaO	7.07	1.94	2.07	11.63	11.06	11.42	12.37	12.42
Na <sub>2</sub> O	0.70	0.78	0.95	0.47	0.68	0.88	0.87	0.70
K <sub>2</sub> O	0.23	0.36	0.44	0.26	0.31	0.36	0.34	0.28
Total	87.38	86.62	88.02	88.74	88.49	86.16	85.65	87.26
Si	27.183	27.288	27.201	27.182	26.751	26.708	26.704	26.576
Al	8.803	8.758	8.824	8.840	9.179	9.265	9.272	9.343
Mg	0.014	0.021	0.000	0.014	0.007	0.000	0.008	0.090
Ca	1.938	2.517	2.466	1.544	1.712	1.320	1.279	1.328
Fe	0.000	0.000	0.000	0.000	0.008	0.008	0.021	0.000
Sr	0.765	0.940	0.973	0.329	0.496	0.575	0.387	0.566
Ba	1.319	0.352	0.372	2.190	2.092	2.241	2.452	2.424
Na	0.646	0.701	0.844	0.438	0.637	0.854	0.853	0.676
K	0.140	0.213	0.257	0.159	0.191	0.230	0.219	0.178
Heu-Ca	40	53	50	33	33	25	25	26
Heu-Sr	16	20	20	7	10	11	7	11
Heu-Ba	27	7	8	47	41	43	47	47
Heu-Na	13	15	17	9	12	16	16	13
Heu-K	3	5	5	3	4	4	4	3

<b>Table 2g</b>	<b>Bratteskjerpet, Kongsberg</b>							
	<b>BS3-A</b>	<b>BS3-B</b>	<b>BS4-A</b>	<b>BS4-B</b>	<b>BS5-A</b>	<b>BS5-B</b>	<b>BS5-C</b>	<b>BS5-D</b>
SiO <sub>2</sub>	56.20	58.21	55.85	55.57	54.83	55.79	57.72	56.32
Al <sub>2</sub> O <sub>3</sub>	15.96	16.14	16.03	16.02	16.56	16.57	17.18	16.19
MgO	0.04	0.23	0.09	0.02	0.00	0.00	0.00	0.06
CaO	2.57	3.32	2.78	4.53	3.33	5.18	5.18	3.04
FeO	0.00	0.00	0.00	0.03	0.02	0.02	0.00	0.00
SrO	1.05	1.00	1.05	3.80	3.16	4.68	4.75	1.22
BaO	13.46	10.42	12.30	3.74	9.43	1.14	0.99	13.70
Na <sub>2</sub> O	0.72	0.76	0.67	1.10	0.93	1.62	1.57	0.91
K <sub>2</sub> O	0.35	0.34	0.25	0.36	0.26	0.33	0.36	0.34
Total	90.35	90.42	89.02	85.17	88.52	85.33	87.75	91.78
Si	26.934	27.132	26.921	26.792	26.464	26.552	26.596	26.716
Al	9.015	8.866	9.107	9.103	9.420	9.294	9.333	9.051
Mg	0.029	0.160	0.065	0.014	0.000	0.000	0.000	0.042
Ca	1.320	1.658	1.425	2.340	1.722	2.641	2.557	1.545
Fe	0.000	0.000	0.000	0.012	0.008	0.008	0.000	0.000
Sr	0.292	0.270	0.293	1.062	0.912	1.292	1.269	0.336
Ba	2.528	1.903	2.323	0.707	1.784	0.213	0.179	2.547
Na	0.669	0.687	0.626	1.028	0.870	1.403	1.403	0.837
K	0.214	0.202	0.154	0.221	0.160	0.200	0.212	0.206
Heu-Ca	26	35	30	44	32	46	45	28
Heu-Sr	6	6	6	20	17	22	23	6
Heu-Ba	50	40	48	13	33	4	3	47
Heu-Na	13	15	13	19	16	24	25	15
Heu-K	4	4	3	4	3	3	4	4

<b>Table 2h</b>	<b>Blåhø, Trollheimen, Oppdal</b>							
	<b>SH1-A</b>	<b>SH1-B</b>	<b>SH1-C</b>	<b>SH1-D</b>	<b>SH1-E</b>	<b>SH1-F</b>	<b>SH1-G</b>	<b>SH1-H</b>
SiO <sub>2</sub>	58.90	57.78	58.22	57.42	57.39	56.44	56.94	58.29
Al <sub>2</sub> O <sub>3</sub>	15.22	16.14	16.36	15.63	15.81	15.82	16.35	16.21
MgO	0.02	0.03	0.00	0.02	0.02	0.01	0.05	0.02
CaO	6.01	5.32	5.40	5.19	5.82	5.21	5.51	5.82
FeO	0.00	0.00	0.00	0.01	0.02	0.04	0.00	0.00
SrO	2.84	3.92	4.14	3.76	3.19	4.10	4.18	3.82
BaO	0.17	0.53	0.72	0.31	0.39	1.29	1.34	0.67
Na <sub>2</sub> O	0.08	0.22	0.32	0.34	0.0	0.35	0.28	0.27
K <sub>2</sub> O	1.50	1.76	1.62	1.66	1.85	1.57	1.68	1.83
Total	84.74	85.70	86.78	84.34	84.49	84.83	86.30	86.93
Si	27.551	27.075	27.014	27.242	27.150	26.965	26.786	27.005
Al	8.391	8.913	8.945	8.740	8.815	8.908	9.065	8.851
Mg	0.014	0.021	0.000	0.014	0.014	0.007	0.035	0.014
Ca	3.012	2.671	2.685	2.638	2.950	2.667	2.777	2.889
Fe	0.000	0.000	0.000	0.004	0.008	0.016	0.000	0.000
Sr	0.770	1.065	1.114	1.034	0.875	1.136	1.140	1.026
Ba	0.031	0.097	0.131	0.058	0.072	0.242	0.247	0.122
Na	0.073	0.200	0.288	0.313	0.000	0.324	0.255	0.243
K	0.895	1.052	0.959	1.005	1.117	0.957	1.008	1.082
Heu-Ca	63	53	52	52	59	50	51	54
Heu-Sr	16	21	21	20	17	21	21	19
Heu-Ba	1	2	3	1	1	5	5	2
Heu-Na	2	4	6	6	0	6	5	5
Heu-K	19	21	19	20	22	18	19	20

Table 2i	Berdalen, Luster			
	BD1-A	BD1-B	BD1-C	BD1-A
SiO <sub>2</sub>	55.09	53.84	56.69	54.95
Al <sub>2</sub> O <sub>3</sub>	15.75	16.24	16.24	16.48
MgO	0.00	0.00	0.00	0.00
CaO	4.08	4.17	3.95	3.64
FeO	0.13	0.05	0.00	0.00
SrO	6.53	7.32	7.24	7.60
BaO	0.32	1.38	0.43	0.81
Na <sub>2</sub> O	0.50	0.00	0.15	0.00
K <sub>2</sub> O	1.29	1.68	1.95	1.55
Total	83.69	84.68	86.65	85.03
Si	26.851	26.414	26.839	26.616
Al	9.047	9.390	9.062	9.408
Mg	0.000	0.000	0.000	0.000
Ca	2.131	2.192	2.004	1.889
Fe	0.053	0.021	0.000	0.000
Sr	1.846	2.082	1.988	2.135
Ba	0.061	0.265	0.080	0.154
Na	0.472	0.000	0.138	0.000
K	0.802	1.051	1.178	0.958
Heu-Ca	40	39	38	37
Heu-Sr	35	37	37	42
Heu-Ba	1	5	2	3
Heu-Na	9	0	3	0
Heu-K	15	19	22	19

Table 2j	Trono- odden n=8	Åmots- dalen 2 n=6	Sjø- skogen n=5	Surka 1 n=4	Surka 2 n=4	Huken n=6
SiO <sub>2</sub>	58.53	57.60	56.34	58.92	59.23	59.01
Al <sub>2</sub> O <sub>3</sub>	16.37	15.83	15.90	15.77	16.11	15.48
MgO	0.01	0.13	0.01	0.03	0.12	0.39
CaO	6.54	5.58	3.67	6.19	6.45	4.45
FeO	0.03	0.00	0.00	0.03	0.00	0.03
SrO	2.14	4.06	4.60	0.91	1.00	3.05
BaO	0.08	0.27	1.11	0.67	0.83	2.27
Na <sub>2</sub> O	0.04	0.05	0.30	0.22	0.34	0.43
K <sub>2</sub> O	2.48	1.63	3.74	2.12	2.13	1.20
Total	86.22	85.15	85.67	84.86	86.21	86.31
Si	27.024	27.123	26.951	27.409	27.228	27.482
Al	8.908	8.785	8.964	8.646	8.728	8.497
Mg	0.007	0.091	0.007	0.021	0.082	0.271
Ca	3.235	2.815	1.881	3.085	3.177	2.220
Fe	0.012	0.000	0.000	0.012	0.000	0.012
Sr	0.573	1.109	1.276	0.245	0.267	0.824
Ba	0.014	0.050	0.208	0.122	0.150	0.416
Na	0.036	0.046	0.278	0.198	0.303	0.388
K	1.461	0.980	2.282	1.258	1.249	0.713
Heu-Ca	61	56	32	63	62	49
Heu-Sr	11	22	21	5	5	18
Heu-Ba	0	1	4	2	3	9
Heu-Na	2	1	5	4	6	9
Heu-K	27	20	39	26	24	16

<b>Table 2k</b>	<b>Tyin, Vang</b>						
	<b>TY1-A</b>	<b>TY1-B</b>	<b>TY1-C</b>	<b>TY2-A</b>	<b>TY2-B</b>	<b>TY2-C</b>	<b>TY1-D</b>
SiO <sub>2</sub>	54.62	51.87	51.44	54.52	54.20	54.03	53.33
Al <sub>2</sub> O <sub>3</sub>	16.57	15.97	15.93	15.93	16.41	15.92	16.22
MgO	0.00	0.01	0.02	0.00	0.02	0.03	0.02
CaO	4.27	2.66	2.77	4.30	2.93	3.50	3.76
FeO	0.02	0.05	0.00	0.04	0.00	0.02	0.03
SrO	5.02	2.61	3.26	3.74	2.76	2.48	2.50
BaO	2.82	10.05	9.69	4.46	10.88	8.78	7.85
Na <sub>2</sub> O	0.89	0.83	0.90	0.69	0.37	0.45	0.84
K <sub>2</sub> O	0.67	0.33	0.27	0.54	0.98	1.01	0.28
Total	84.88	84.38	84.28	84.22	88.53	86.22	84.83
Si	26.495	26.381	26.310	26.745	26.470	26.650	26.493
Al	9.473	9.573	9.603	9.210	9.445	9.255	9.496
Mg	0.000	0.008	0.015	0.000	0.015	0.022	0.015
Ca	2.219	1.450	1.518	2.260	1.533	1.850	2.001
Fe	0.008	0.021	0.000	0.016	0.000	0.008	0.012
Sr	1.412	0.770	0.967	1.064	0.782	0.709	0.720
Ba	0.536	2.003	1.942	0.857	2.082	1.697	1.528
Na	0.837	0.818	0.892	0.656	0.350	0.430	0.809
K	0.415	0.435	0.176	0.338	0.611	0.636	0.177
Heu-Ca	41	26	28	43	29	35	38
Heu-Sr	26	14	18	20	15	13	14
Heu-Ba	10	37	35	17	39	32	29
Heu-Na	15	15	16	13	7	10	15
Heu-K	8	8	3	7	11	12	3

<b>Table 2l</b>	<b>Pålshaugen, Feiring</b>					
	<b>PH1-A</b>	<b>PH1-B</b>	<b>PH1-C</b>	<b>PH1-D</b>	<b>PH1-E</b>	<b>PH1-F</b>
SiO <sub>2</sub>	56.30	57.10	60.16	57.23	60.74	60.40
Al <sub>2</sub> O <sub>3</sub>	15.87	15.07	14.08	15.76	13.84	13.57
MgO	0.15	0.68	0.86	0.12	1.74	1.32
CaO	5.56	4.98	5.44	5.69	4.89	5.27
FeO	0.00	0.00	0.03	0.22	0.00	0.03
SrO	4.01	3.26	1.99	3.53	0.68	0.92
BaO	0.11	0.28	0.09	0.00	0.06	0.00
Na <sub>2</sub> O	0.43	0.19	0.21	0.42	0.12	0.15
K <sub>2</sub> O	1.56	1.60	0.77	1.65	0.19	0.21
Total	83.99	83.16	83.63	84.62	83.26	81.87
Si	26.913	27.336	28.085	27.078	28.318	28.379
Al	8.941	8.503	7.747	8.782	7.605	7.514
Mg	0.107	0.485	0.599	0.085	1.209	0.925
Ca	2.848	2.554	2.721	2.882	2.443	2.653
Fe	0.000	0.000	0.017	0.087	0.000	0.012
Sr	1.112	0.905	0.539	0.968	0.184	0.251
Ba	0.021	0.053	0.017	0.000	0.011	0.000
Na	0.399	0.176	0.190	0.385	0.108	0.137
K	0.951	0.977	0.459	0.995	0.113	0.126
Heu-Ca	53	55	69	55	85	84
Heu-Sr	29	19	14	19	6	8
Heu-Ba	0	1	0	0	0	0
Heu-Na	7	4	5	7	4	4
Heu-K	18	21	12	19	4	4

Table 2m	Årdal							
	ÅR1-A	ÅR1-B	ÅR2-A	ÅR2-B	ÅR2-C	ÅR2-D	ÅR2-E	ÅR2-F
SiO <sub>2</sub>	56.75	56.12	56.85	56.33	54.62	55.51	56.75	55.85
Al <sub>2</sub> O <sub>3</sub>	14.98	15.20	14.64	14.23	14.83	15.04	14.85	15.63
MgO	0.06	0.04	0.02	0.18	0.00	0.02	0.01	0.02
CaO	4.28	3.77	3.58	4.13	3.78	4.04	4.18	3.96
FeO	0.05	0.02	0.04	0.00	0.05	0.00	0.06	0.07
SrO	4.93	2.97	2.48	2.88	3.39	4.10	4.98	3.62
BaO	1.30	6.62	7.08	4.29	5.36	3.40	1.32	6.30
Na <sub>2</sub> O	0.41	0.42	0.29	0.28	0.28	0.27	0.20	0.29
K <sub>2</sub> O	0.68	1.22	1.08	1.11	1.26	1.25	1.43	1.26
Total	83.44	86.38	86.06	83.43	83.57	83.63	83.78	87.00
Si	27.441	27.168	27.357	27.620	27.180	27.238	27.458	26.930
Al	8.537	8.672	8.357	8.223	8.697	8.698	8.468	8.883
Mg	0.043	0.029	0.014	0.132	0.000	0.015	0.007	0.014
Ca	2.217	1.955	1.858	2.169	2.015	2.124	2.167	2.046
Fe	0.020	0.008	0.016	0.000	0.021	0.000	0.024	0.028
Sr	1.382	0.834	0.696	0.819	0.978	1.167	1.398	1.012
Ba	0.246	1.256	1.344	0.824	1.045	0.654	0.250	1.190
Na	0.384	0.394	0.272	0.266	0.270	0.257	0.188	0.271
K	0.419	0.753	0.667	0.694	0.800	0.782	0.883	0.775
Heu-Ca	48	38	38	45	39	43	44	39
Heu-Sr	30	16	14	17	19	23	29	19
Heu-Ba	5	24	28	17	20	13	5	22
Heu-Na	8	8	6	6	5	5	4	5
Heu-K	9	15	14	15	16	16	18	15

Table 2n	E 18, Holmestrand					
	HS1-A	HS1-B	HS1-C	HS1-D	HS1-E	HS1-F
SiO <sub>2</sub>	54.80	53.67	54.24	56.70	54.46	54.06
Al <sub>2</sub> O <sub>3</sub>	16.29	16.27	16.34	15.13	16.18	16.48
MgO	0.03	0.06	0.06	0.41	0.14	0.03
CaO	2.86	2.68	2.80	2.70	2.63	2.80
FeO	0.03	0.02	0.00	0.00	0.01	0.02
SrO	4.99	4.62	4.69	3.13	4.30	5.19
BaO	3.97	3.63	4.16	3.07	4.78	3.56
Na <sub>2</sub> O	0.81	1.30	0.56	0.38	0.62	1.74
K <sub>2</sub> O	2.57	1.86	3.23	3.28	2.96	1.05
Total	86.35	84.11	86.08	84.8	86.08	84.93
Si	26.587	26.535	26.493	27.374	26.599	26.465
Al	9.314	9.480	9.406	8.609	9.314	9.508
Mg	0.022	0.044	0.044	0.300	0.102	0.022
Ca	1.487	1.420	1.465	1.396	1.376	1.469
Fe	0.012	0.009	0.000	0.000	0.004	0.008
Sr	1.404	1.324	1.328	0.876	1.218	1.473
Ba	0.755	0.703	0.796	0.581	0.915	0.683
Na	0.762	1.246	0.530	0.356	0.587	1.652
K	1.591	1.173	2.013	2.020	0.844	0.656
Heu-Ca	25	24	24	25	28	25
Heu-Sr	23	23	22	16	25	25
Heu-Ba	13	12	13	11	19	12
Heu-Na	13	21	9	6	12	28
Heu-K	26	20	33	37	17	11

Table 2o	Falkensten, Horten				Reggestad, Holmestrand		
	FS1-A	RS1-A	RS1-B	RS1-C	FS1-B	FS2-A	FS2-B
SiO <sub>2</sub>	55.40	54.11	55.87	56.72	60.58	58.78	60.77
Al <sub>2</sub> O <sub>3</sub>	15.92	15.97	16.81	16.16	14.22	15.41	15.65
MgO	0.23	0.00	0.00	0.07	0.69	0.19	0.17
CaO	2.71	3.34	3.00	3.42	3.63	3.21	2.99
FeO	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SrO	3.79	4.59	5.49	4.08	2.52	4.25	3.19
BaO	4.92	2.32	3.44	3.76	0.87	1.30	2.69
Na <sub>2</sub> O	0.76	1.82	0.61	0.39	0.51	0.71	0.83
K <sub>2</sub> O	2.62	1.12	3.04	2.73	2.31	2.66	2.99
Total	86.35	83.27	88.26	87.33	85.33	86.51	89.28
Si	26.820	26.670	26.511	26.905	28.143	27.502	27.644
Al	9.083	9.277	9.401	9.034	7.786	8.498	8.390
Mg	0.166	0.000	0.000	0.050	0.478	0.133	0.115
Ca	1.406	1.764	1.525	1.764	1.807	1.609	1.457
Fe	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sr	1.064	1.312	1.511	1.122	0.679	1.153	0.841
Ba	0.933	0.448	0.640	0.700	0.158	0.238	0.480
Na	0.713	1.739	0.561	0.359	0.459	0.644	0.732
K	1.618	0.704	1.840	1.652	1.369	1.588	1.735
Heu-Ca	22	30	25	32	40	31	28
Heu-Sr	17	22	25	20	15	22	16
Heu-Ba	15	8	11	13	4	5	9
Heu-Na	11	29	9	6	10	12	14
Heu-K	26	12	15	30	31	30	33

Table 2p	Haukåsen, Drammen			Sørvollen, Lier			
	HÅ1-A	HÅ1-B	HÅ1-C	SV1-A	SV1-B	SV1-C	SV2-A
SiO <sub>2</sub>	56.48	58.63	58.11	56.65	56.16	59.64	56.94
Al <sub>2</sub> O <sub>3</sub>	15.60	15.28	15.65	15.40	15.97	14.23	16.74
MgO	0.00	0.03	0.08	0.08	0.11	0.32	0.02
CaO	4.26	5.93	4.79	4.65	4.07	4.59	4.43
FeO	0.00	0.06	0.01	0.10	0.00	0.03	0.00
SrO	6.85	3.63	5.38	3.74	4.10	2.33	4.66
BaO	0.03	0.30	0.18	1.70	2.40	1.20	1.58
Na <sub>2</sub> O	0.16	0.11	0.15	0.11	0.15	0.16	0.30
K <sub>2</sub> O	1.64	1.37	1.57	2.26	2.52	1.97	3.19
Total	85.02	85.34	85.92	84.69	85.48	84.47	87.86
Si	27.058	27.425	27.260	27.175	26.930	28.050	26.949
Al	8.808	8.424	8.652	8.707	9.026	7.888	8.780
Mg	0.000	0.021	0.056	0.057	0.079	0.224	0.014
Ca	2.187	2.972	2.407	2.390	2.091	2.313	2.246
Fe	0.000	0.023	0.039	0.040	0.000	0.012	0.000
Sr	1.903	0.985	1.463	1.040	1.140	0.635	1.279
Ba	0.006	0.055	0.033	0.320	0.451	0.221	0.293
Na	0.149	0.100	0.136	0.102	0.139	0.146	0.275
K	1.002	0.818	0.940	1.383	1.542	1.182	1.926
Heu-Ca	42	60	48	46	39	51	37
Heu-Sr	36	20	29	20	21	14	2
Heu-Ba	0	1	1	6	8	5	5
Heu-Na	3	2	3	2	3	3	5
Heu-K	19	17	19	26	29	26	32

Table 2q	Myrsetra, Drammen						
	MS1-A	MS1-B	MS1-C	MS1-D	MS1-E	MS1-F	MS1-G
SiO <sub>2</sub>	54.51	55.08	56.13	54.53	55.45	55.99	54.77
Al <sub>2</sub> O <sub>3</sub>	16.12	15.77	15.01	15.64	15.81	15.51	15.99
MgO	0.00	0.00	0.01	0.00	0.02	0.02	0.01
CaO	4.34	4.78	4.76	4.74	4.44	4.65	4.74
FeO	0.00	0.00	0.00	0.00	0.02	0.04	0.00
SrO	4.88	5.08	2.86	3.10	3.32	3.45	4.43
BaO	1.04	0.87	4.34	4.80	5.18	3.20	2.42
Na <sub>2</sub> O	0.28	0.28	0.00	0.13	0.12	0.13	0.26
K <sub>2</sub> O	2.14	1.79	0.75	1.22	0.99	1.40	1.78
Total	83.31	83.65	83.86	84.16	85.35	84.39	84.40
Si	26.691	26.821	27.353	26.823	26.910	27.107	26.680
Al	9.303	9.050	8.621	9.067	9.043	8.850	9.180
Mg	0.000	0.000	0.007	0.000	0.014	0.014	0.007
Ca	2.277	2.494	2.485	2.498	2.309	2.412	2.474
Fe	0.000	0.000	0.000	0.000	0.009	0.016	0.000
Sr	1.386	1.434	0.808	0.884	0.934	0.969	1.251
Ba	0.200	0.166	0.829	0.925	0.985	0.607	0.462
Na	0.266	0.264	0.000	0.124	0.113	0.122	0.126
K	1.337	1.112	0.466	0.766	0.613	0.845	1.106
Heu-Ca	42	46	54	48	47	49	46
Heu-Sr	25	26	18	17	19	20	23
Heu-Ba	4	3	18	18	20	12	9
Heu-Na	5	5	0	2	2	2	2
Heu-K	24	20	10	15	12	17	20

Table 2r	Vardåsen, Asker							
	VÅ1-A	VÅ1-B	VÅ1-C	VÅ1-D	VÅ2-A	VÅ2-B	VÅ3-A	VÅ3B
SiO <sub>2</sub>	55.09	52.71	54.16	54.30	57.55	56.17	55.63	56.35
Al <sub>2</sub> O <sub>3</sub>	16.06	15.98	15.71	15.54	16.34	15.51	15.48	15.69
MgO	0.00	0.09	0.43	0.38	0.03	0.04	0.06	0.16
CaO	3.55	3.38	3.18	3.54	2.99	3.20	3.54	3.32
FeO	0.03	0.00	0.01	0.00	0.00	0.03	0.00	0.02
SrO	5.09	3.55	3.23	2.93	4.06	3.50	3.08	3.38
BaO	1.23	5.50	4.75	6.00	5.34	4.90	5.40	4.83
Na <sub>2</sub> O	0.76	0.23	0.00	0.20	0.65	0.23	0.05	0.20
K <sub>2</sub> O	3.28	2.56	2.42	2.07	2.51	3.13	2.84	2.82
Total	85.09	84.00	83.92	84.96	90.47	86.71	86.08	86.77
Si	26.688	26.448	26.814	26.779	26.921	27.062	27.014	27.031
Al	9.170	9.450	9.167	9.032	9.009	8.807	8.859	8.870
Mg	0.000	0.067	0.317	0.279	0.021	0.029	0.043	0.114
Ca	1.842	1.817	1.687	1.870	1.500	1.652	1.841	1.706
Fe	0.012	0.000	0.004	0.000	0.000	0.012	0.000	0.008
Sr	1.430	1.033	0.927	0.838	1.101	0.978	0.867	0.940
Ba	0.215	1.081	0.922	1.160	0.979	0.925	1.028	0.908
Na	0.714	0.224	0.000	0.191	0.590	0.215	0.047	0.186
K	2.027	1.639	1.528	1.302	1.500	1.924	1.759	1.726
Heu-Ca	30	31	33	35	28	29	33	31
Heu-Sr	23	18	18	16	21	17	16	17
Heu-Ba	3	19	18	22	18	16	19	17
Heu-Na	11	4	0	4	11	4	1	3
Heu-K	33	28	30	24	28	34	32	32

Table 3. The analytical results for heulandites reported by Larsen et al. (2005).

	Northern Ravnås prospect				
	R1	R2	R3	R4	R5
SiO <sub>2</sub>	54.26 (52.51-55.91)	53.15	54.20	54.41	55.65
Al <sub>2</sub> O <sub>3</sub>	15.27 (14.54-15.77)	14.68	14.54	15.35	16.00
MgO	<0.1 (<0.1)	<0.1	<0.1	0.46	<0.1
CaO	2.65 (2.30-2.87)	2.32	2.59	3.40	4.17
SrO	1.03 (0.64-2.18)	0.98	1.55	1.12	5.26
BaO	12.76 (11.17-13.84)	13.84	11.17	9.70	3.20
Na <sub>2</sub> O	0.34 (0.23-0.50)	0.41	0.26	0.22	0.76
K <sub>2</sub> O	0.58 (0.49-0.86)	0.52	0.53	0.71	0.31
H <sub>2</sub> O	13.1				
Total	99.99	85.90	84.84	85.37	85.35
Si	27.008	27.052	27.338	26.943	26.839
Al	8.958	8.806	8.644	8.958	9.094
Mg	0.000	0.000	0.000	0.340	0.000
Ca	1.413	1.265	1.400	1.804	2.155
Sr	0.297	0.289	0.453	0.322	1.471
Ba	2.489	2.760	2.208	1.882	0.605
Na	0.328	0.405	0.254	0.211	0.711
K	0.368	0.338	0.341	0.449	0.191
H <sub>2</sub> O	21.747				
Heu-Ca	29	25	30	39	42
Heu-Sr	6	6	10	7	29
Heu-Ba	50	55	47	40	12
Heu-Na	7	8	5	5	14
Heu-K	7	7	7	10	4

	Bratteskjerpet						Sjoa		
	B1	B2	B3	B4	B5	B6	S1	S2	S3
SiO <sub>2</sub>	54.51	55.36	54.96	54.96	55.57	55.43	56.54	57.21	53.29
Al <sub>2</sub> O <sub>3</sub>	16.06	15.46	15.52	15.27	15.64	15.18	17.44	15.65	15.94
MgO	0.10	0.13	<0.1	<0.1	<0.1	0.20	<0.1	<0.1	<0.1
CaO	2.25	2.93	3.43	3.54	3.85	3.24	4.48	2.82	1.27
SrO	1.75	1.22	2.45	2.72	3.89	1.49	7.90	6.30	2.58
BaO	12.67	11.81	8.00	7.30	5.85	10.22	1.07	5.78	16.57
Na <sub>2</sub> O	0.58	0.53	0.67	0.65	0.68	0.59	0.44	0.08	0.39
K <sub>2</sub> O	0.68	0.62	0.48	0.51	0.53	0.62	1.20	1.44	0.76
Total	88.60	88.06	85.51	84.95	86.01	86.97	89.07	89.28	90.80
Si	26.708	27.000	27.003	27.085	26.950	27.094	26.280	27.095	26.466
Al	9.274	8.886	8.987	8.869	8.940	8.745	9.554	8.736	9.330
Mg	0.073	0.095	0.000	0.000	0.000	0.146	0.000	0.000	0.000
Ca	1.181	1.531	1.806	1.869	2.001	1.697	2.231	1.431	0.676
Sr	0.497	0.345	0.698	0.777	1.094	0.422	2.129	1.730	0.743
Ba	2.433	2.257	1.540	1.410	1.112	1.958	0.195	1.073	3.225
Na	0.551	0.501	0.638	0.621	0.639	0.559	0.397	0.073	0.376
K	0.425	0.386	0.301	0.321	0.328	0.387	0.712	0.870	0.482
Heu-Ca	23	30	36	37	39	34	39	28	12
Heu-Sr	10	7	14	16	21	8	38	33	14
Heu-Ba	48	45	31	28	21	39	3	21	59
Heu-Na	11	10	13	12	12	11	7	1	7
Heu-K	8	8	6	6	6	8	13	17	9